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(54) Substrate support apparatus for a deposition chamber

Substratträgervorrichtung für eine Beschichtungskammer

Dispositif de support de substrat pour une chambre de dépôt

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Description

[0001] This invention relates generally to deposition shields for processing chambers, including for example physical vapor deposition or sputtering chambers, chemical vapor deposition chambers and ion implantation chambers. More specifically, the invention relates to a removable deposition ring for facilitating full wafer deposition while protecting the wafer support pedestal from the deposition species.

[0002] In deposition processes, species from a source such as a target, a gas inlet manifold and the like may deposit on exposed internal chamber surfaces, including the chamber walls and hardware. Shields are available which are designed to intercept such species.

[0003] EP-A-0606751 discloses a deposition chamber having a susceptor having an upper surface to receive a substrate for processing. A preheat ring mounted on the side wall of the chamber has an extension in an upper surface thereof which meets with the extension of the susceptor. The mating extensions provide a barrier to reduce the amount of reaction gases than can pass into the gap between them and deposit solid material on to the back side surface of the susceptor.

[0004] EP-A-0 742 579 describes an assembly for supporting a substrate during processing in a plasma chamber. The assembly comprises a substrate support, an annular ring around the upper portion of the support and a clamping ring to hold the substrate onto the support.

[0005] EP-A-0 747 932 describes a deposition chamber shield assembly comprising a pedestal for supporting a substrate, a deposition ring circumscribing said pedestal and a shield member extending circumferentially around the pedestal (Fig.1).

[0006] The presently available shields have not been successful in completely blocking unwanted deposition on these surfaces. Also, such shields may be difficult and/or time-consuming to replace, and require relatively frequent replacement. The use of automatic substrate exchange systems, with their attendant in-chamber movable components, increases the difficulty of attaining adequate shielding and easy replacement of these shields.

[0007] Therefore, there is a need in the art for shields that provide adequate shielding of chamber components as well as easy replacement.

[0008] This invention as claimed in claim 1 provides a substrate support apparatus comprising, a pedestal having a support surface for supporting a substrate and having a flange extending from the outer edge of the pedestal; and a deposition ring circumscribing said support surface for shielding said pedestal; characterised in that the ring extends over and is removably supported on the pedestal flange and has a plurality of protrusions extending from a surface of said ring proximate to said support surface for centering a substrate upon the support surface as the substrate is placed upon the pedestal.

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[0009] The removable deposition ring prevents the deposition species from being deposited upon the substrate support pedestal for the substrate (wafer) within the reaction chamber. The deposition ring circumscribes the peripheral edge of the substrate support pedestal and is coaxially aligned with the center axis of the pedestal. The deposition ring rests upon a flange extending from the outer edge of the pedestal. The inner circumference of the deposition ring abuts the circumferential edge of the pedestal and the top surface of the deposition ring is substantially coplanar with the substrate support surface of the pedestal such that the deposition ring is, in essence, a radial extension of the substrate support surface of the pedestal. The outer edge of the deposition ring supports a shield or cover ring. The deposition ring is removable from the pedestal for cleaning and/or disposal.

[0010] The deposition ring may include substrate locating or centering means mounted about the periphery of the substrate. The centering means engages the peripheral edge of the substrate to center the substrate at a centrally located substrate mounting position upon the pedestal. The deposition ring also may include a groove or channel extending along the periphery of the substrate mounting position for allowing deposition on the deposition ring peripheral to the substrate without interfering with the substrate on the support surface of the pedestal.

[0011] Preferably, when the groove is used, the centering means is a plurality of elongated pins formed at spaced locations along the groove.

[0012] Importantly, the deposition ring is effective and easily removed from the pedestal for cleaning and/or replacement.

[0013] Features such as the peripheral groove increase the processing time between ring cleanings. In addition, other components operating in conjunction with the deposition ring, including the cover ring and a chamber shield, define a shielding assembly that is especially tailored to eliminate build-up of deposits that would interfere with support of the substrate. Uniquely, features such as a gap between the edge of the substrate and the support assembly permit the entire upper surface of the substrate to be available for deposition.

[0014] The invention as claimed in claim 8 also provides a deposition chamber shield assembly for restricting the deposition of materials on internal chamber components during processing of a substrate in the deposition chamber, comprising, a pedestal having a support surface for supporting a substrate and having a flange extending from the outer edge of the pedestal, and a shield member extending circumferentially around the support surface for the substrate over the flange of the pedestal to prevent deposition of the deposition chamber regions shielded by said shield member during processing of the substrate in the deposition chamber, wherein a deposition ring circumscribes the pedestal

and is removably supported by said flange for shielding said pedestal, and a cover ring extends from the shield member over an outer edge of the deposition ring and terminates adjacent an edge of the substrate, said cover ring shielding an edge region of the deposition ring to prevent the passage of deposition materials past the edge of deposition ring.

[0014] Further, the invention relates to a deposition chamber shield assembly as claimed in claim 18.

[0015] The above and other aspects, features and advantages of the invention are described below with respect to the drawing, in which:

Figure 1 is a schematic simplified partial vertical section view of a shielded processing chamber;
Figure 2 is a schematic simplified partial vertical sectional view of an automatic substrate exchange system;

Figure 3 illustrates an alternative embodiment of the shield arrangement depicted in Figure 1;

Figure 4 is a simplified schematic representation of the relationship of the wafer, the wafer support member, the wafer centering or locating means, and a robot transfer blade;

(Figures 1-4 being not according to the invention)

FIG. 5 is a schematic simplified partial vertical cross-sectional view of a shielded processing chamber incorporating an embodiment of the present invention;

FIG. 6 is a schematic simplified partial vertical cross-sectional view of a shielded processing chamber incorporating an alternative embodiment of the present invention, where the deposition ring contains a peripheral groove and centering pins; and

FIG. 7 is a top plan view of the deposition ring of FIG. 6.

[0016] Figure 1 illustrates a sputtering chamber 2. The substrate 14 is positioned adjacent chamber processing region 8 on a support member 16 such as a susceptor or a pedestal. By way of example, the diameter of the support member 16 is greater than that of the substrate 14. In the exemplary arrangement, the support member 16 may be attached, as by a plurality of screws 9-9, Figure 2, to a conventional vertically movable elevator system 18. (Please note, hardware such as gas inlet manifolds and/or sputtering targets is omitted for clarity.)

[0017] The exemplary sputter chamber 2 includes a cylindrical chamber wall 3 and a support ring 4 which is mounted to the top of the chamber wall, as by welding. An adaptor plate 5 which may form the top wall of the chamber 2 is attached to the support ring 4 by a plurality of screws 6-6. O-ring 7 provides an hermetic seal. A deposition source (not shown) such as sputtering target assembly or a gas inlet manifold may be mounted in re-

cess 58 and sealed from the ambient. A wall-like cylindrical shield member 10 is mounted to the support ring 4. That is, the cylindrical shield 10 has an outwardly extending upper lip 11 which is attached to the bottom of

5 the adaptor plate 5 by a plurality of screws 12-12. The cylindrical shape of the shield member 10 is illustrative of a shield member that conforms to the shape of the chamber and/or the substrate. The shield member 10 may, of course, be of any shape. A flange 15 extending upward from annular bottom wall 13 of the shield member 10 surrounds the periphery of the substrate support member 16, leaving a space 17 between the shield flange 15 and the support 16.

[0018] The deposition shield assembly 1 also includes an annular shield ring 20 having an inner diameter which is selected so that the ring fits peripherally over the support 16 adjacent to the substrate 14. The ring 20 comprises a downward extending, tapered centering flange 22 which fits into the opening 17 between the flange 15 and the side edge of the substrate support 16, and a second, outer flange 23 which is generally parallel to flange 22. The shield ring 20 is mounted in removable fashion at the periphery of the substrate 14 by seating the two flanges over the mating flange 15 of the cylindrical shield means 10, with the tapered centering flange 22 extending into the opening 17. The shield ring 20 also comprises a raised, inward-extending roof 25 which protects the periphery of the substrate from species traveling inwardly, for example, along direction 56, and prevents deposition on the surfaces on which the shield ring 20 rests and on the associated ring-surface interfaces.

[0019] As mentioned, the shield assembly uniquely combines full effective shielding of the chamber with easy removal. Specifically, effective shielding action is provided by the cylindrical shield member 10, the relatively wide substrate support member 16 (that is, the support which extends laterally beyond the substrate) and the shield ring 20, which overlaps both the substrate support and the inward-extending bottom section of the shield member 10. These overlapping components combine to isolate the processing region of the chamber 8 from the rest of the chamber interior and shield the rest of the chamber (for example, chamber walls such as 3 and the internal chamber hardware such as the movable elevator 18 beneath the support member 16) from deposition. The shield components are easily removed, by removing the adaptor plate mounting means such as the screws 6-6 and lifting, as a unit, the adaptor plate 5; the shield member 10, which is attached to the adaptor plate; and the shield ring 20, which is supported in removable fashion on the shield member 10. The dual-function substrate support member and shield component 16 is then easily removed by removing the three mounting screws 9-9, Figure 2. Alternatively, the shield ring 20 can be removed by simply lifting the ring out of the locating space 17, or the shield ring can be removed to permit removal of the substrate support member 16,

if desired, without removing the shield 10. Obviously, the shield components are replaced for example by attaching the substrate support member 16 using screws 9-9, and inserting the shield unit and attaching the unit via screws 6-6.

[0020] Substrate locating or centering means such as protrusions or bumps 35-35 (see Figure 4 as well as Figure 1) are formed in the upper surface of the substrate support member 16 peripheral to the mounting position of the substrate 14 for precisely centering the substrate on the support. As shown in Figure 4, four alignment bumps 35-35 are positioned at 90° intervals in a rectangular array, to effect the positioning function 360° about the periphery of the wafer 14. The centering means limits lateral movement of the wafer 14 relative to the substrate support member 16; thereby, ensuring the wafer is positioned at the desired location on the substrate support member for processing as well as ensuring the wafer is in position on the support for pick-up by the robot blade 34. The centering function permits full wafer deposition, that is, deposition over the entire surface of a substrate such as wafer 14, without using edge clamps, or where clamps are not required. Preferably, the alignment bumps 35-35 are rounded (for example, hemispherical) to avoid sharp corners which can cause particles to flake off into the processing environment.

[0021] Referring to Figures 1, 2 and 4, in the illustrated chamber system 2, the substrate support member 16 is mounted to the elevator 18 for vertical movement relative to an arrangement of pins 30-30 which themselves are moved vertically by a second vertical lift or elevator mechanism 32. The coordinated vertical movement of the substrate support member 16 and the substrate support pins 30-30 (which extend through holes 33-33 in the substrate support) in combination with the coordinated horizontal movement of a substrate transfer blade 34, Figure 4, transfers substrates into and out of the chamber and onto and off the substrate support member 16. In addition, vertical movement of the substrate support member 16 by elevator 18 permits precise positioning of the substrate relative to the source such as a gas inlet manifold and/or a sputtering target. This type of automatic substrate exchange and positioning system is known in the art and is described for example in commonly assigned U.S. Patent 4,951,601 issued August 28, 1990 to inventors Maydan et al.

[0022] Despite the complications provided by the above-described moving parts, the deposition shield assembly 1 provides effective shielding against unwanted deposition and is readily removable and replaceable. Please note, although the illustrated cylindrical shield assembly 1 is configured for a circular semiconductor wafer, other shield configurations may be used as required to conform to other substrate and chamber configurations.

[0023] A spacer means, in the form of a plurality of pins 36-36 threaded through mating holes 37-37 in the substrate support member 16, supports the substrate

14 just above the upper surface of that member. In providing a small gap 50 (see Figure 3) between the support member 16 and the wafer 14, the spacer means prevents material which deposits along the exposed periphery of the support member at the edge of the substrate from bonding to the substrate and from bonding the support member to the substrate. The spacer(s) thus facilitate full wafer deposition. The height of the pins 36-36 preferably provides a gap of about 0.5 - 1 millimeter between the substrate and its support member 16. A gap greater than about 1 millimeter may allow the deposited material to reach the backside of the substrate.

[0024] Figure 3 depicts an alternative shielded substrate support member 16A which is preferred for high rate deposition, typically of relatively low stress material such as aluminum and aluminum-containing compounds of other materials. Please note, typical processes may deposit about 100 nm (1000 Angstroms) of material per wafer, with the result that perhaps 5000 wafers can be processed before the support or pedestal 16 must be cleaned. Aluminum thickness, however, may be 1000 nm (10,000 Angstroms) per wafer. Because of the possibility of backside deposition, the gap 50 cannot be increased sufficiently to accommodate this increased deposit thickness. Instead, a channel or groove 38 is formed in the substrate support member 16A along the periphery of the substrate 14. The groove 38 allows additional build-up of deposited material (relative to a planar configuration) on the support member 16A along the edge of the substrate 14 without the material sticking to the substrate and without interfering with the positioning and orientation of the substrate on the support.

[0025] In the Figure 3 embodiment, the centering means is located in the groove and, thus, comprises elongated threaded centering pins 40-40 of adjustable length which are attached to the substrate support 16A via threaded holes, instead of the smaller (shorter) centering bumps or protrusions 35-35, Figure 1. Also, gap 51 between the roof 25 and the substrate support beneath the roof prevents the roof from sticking to the support. In addition, the radial length of the inward extending roof prevents deposited material from reaching the surfaces upon which the roof is supported.

[0026] Useful material for the components of the shield assembly 1 include stainless steel, aluminum, titanium and copper. Stainless steel is a preferred material because it is relatively easy to clean. Aluminum or copper may be preferred when depositing materials such as tungsten which do not stick to stainless steel.

[0027] Figure 4 is a simplified schematic drawing, not to scale, depicting the relationship of the wafer 14, the locating or centering means (35 or 40), the substrate support member 16 and the robot transfer blade 34. In the illustrated embodiment, the centering means comprises four bumps 35-35 spaced at 90° intervals around the near-periphery of the wafer support member 16 for effecting secure positioning 360° around the substrate. [0028] Although operation of the robot blade of the

type contemplated here is well known, one mode of operation will be reviewed to ensure understanding of the cooperation among the various components. To position a wafer 14 on the support 16, the wafer is positioned on the robot blade 34 and the blade is inserted into the chamber, typically through a slit valve-controlled opening or other suitable opening (not shown) in the chamber wall, to position the wafer over the retracted (lowered) support 16 and pin array 30-30. The pins 30-30 are raised by elevator 32 relative to the substrate support member 16 to lift the substrate 14 off the robot blade 34. The robot blade is withdrawn and the elevator 32 and pins 30-30 are lowered relative to the substrate support member 16, thereby depositing the substrate onto the spacer support pins 36-36, with the substrate being centered by the locating means 35-35. In the illustrated embodiment, elevator 18 can be used to vary the vertical position of the support 16 and the substrate 14 relative to the processing region or the sputtering source or the gas inlet manifold, etc., to control the fabrication process.

[0029] Conversely, to remove the substrate 14 from the chamber after processing, the pins 30-30 are elevated through the holes 33-33 relative to the substrate support member 16, then the robot blade 34 is inserted between the substrate support member and the substrate to lift the substrate off the spacer support pins 36-36. Elevator 32 is actuated to lower the elevator pins 30-30, to deposit the substrate 14 on the robot blade 34 and the robot blade and the substrate are withdrawn from the chamber.

[0030] FIG. 5 depicts a cross-sectional view of an embodiment of the inventive shield assembly 500. In this embodiment, the substrate support surface 502 of the pedestal 504 does not extend beyond the periphery of the substrate 14. The pedestal has a peripheral flange 506 extending radially from the outer edge of the pedestal. This flange 506 has a top surface that supports a deposition ring 508. The deposition ring circumscribes the substrate support pedestal such that the inner edge of the deposition ring abuts the outer edge of the pedestal, while the support surface 502 of the pedestal 504 is coplanar with a top surface 510 of the deposition ring 508. In essence, the deposition ring is a removable extension of the support surface of the pedestal. In its simplest form, the deposition ring 508 is an annular ring having a rectangular cross section. Alternatively, the ring could include the centering means, e.g.,, bumps 512, which serve the same purpose as the bumps 35 of FIG. 1.

[0031] More specifically, the deposition shield assembly 500 is formed of an annular cover (or shield) ring 20 having an inner diameter which is selected so that the cover ring fits peripherally over the outer diameter of the deposition ring which circumscribes the outer edge of the pedestal 504. The annular cover (or shield) ring 20, as described above with respect to FIGS. 1 and 3, comprises a downward extending tapered center flange 22

which fits into an opening between the shield member flange 15 and the outer edge 514 of the deposition ring. The shield member flange, which generally is parallel to the cover ring flange, the cover ring is mounted in a removable fashion at the periphery of the shield member by seating the two flanges with the tapered centering flange extending into the opening between the deposition ring and the shield member flange. The cover ring also comprises a raised, inward extending roof 25 which prevents deposition on the surfaces on which the cover ring rests. Additionally, a gap 51 between the roof 25 of the cover ring 20 and the top surface 510 of the deposition ring 508 beneath the roof prevents the roof from sticking to the deposition ring. In addition, the radial length of the inward extending roof prevents deposited material from reaching the surfaces upon which the roof is supported on the deposition ring.

[0032] To support the deposition ring 508, the peripheral edge of the pedestal is adapted to include a support flange 506 radially extending from the entire circumference of the pedestal. The annular deposition ring rests on the support flange and extends from the periphery of the pedestal 504 to the cover ring 20. As such, the outer peripheral edge 514 of the deposition ring 508 supports the cover ring 20. The surface 502 of the pedestal which supports the substrate has a diameter that is approximately equivalent to the diameter of the substrate 14. Preferably, this support surface diameter may be slightly smaller than the substrate diameter, such that, when a substrate is positioned on the support pedestal, no portion of the pedestal surface will be exposed to the deposition species. As such, the pedestal surface is protected from such deposition.

[0033] The shield assembly 500 uniquely combines full effective shielding of the chamber with easy removal. Specifically, effective shielding action is provided by the cylindrical shield member 10, the deposition ring 508 and the cover ring 20 which overlaps both the deposition ring and the inward extending bottom section of the shield member. These overlapping components combine to isolate the processing region 8 of the chamber from the remainder 516 of the chamber interior and shield the remainder of the chamber (for example, chamber walls and the internal chamber hardware, such as the moveable elevator that generally lies beneath the substrate support member) from deposition. The shield assembly components are easily removed by removing the adaptor plate mounting means, such as the screws, and lifting out as a single unit the adaptor plate; the shield member, which is attached to the adaptor plate; and the cover ring which is supported in removable fashion on the shield member. The deposition ring is then easily removed from the periphery of the pedestal. Alternatively, the shield ring and the deposition ring can be removed by simply lifting the rings out of the locating space.

[0034] In accordance with another aspect of the invention, substrate locating or centering means 512,

such protrusion, bumps, or pins are formed upon the upper surface 510 of the deposition ring 508 peripheral to the mounting position of the substrate upon the pedestal surface. The centering means precisely centers the substrate on the substrate support. These bumps 512 function in the same manner as the bumps 35 of FIG. 1 and 2.

[0035] More specifically, four alignment bumps 512-512 are positioned at 90 degree intervals in a rectangular array to effect the positioning function 360 degrees about the periphery of the substrate 14. The centering means limits lateral movement of the substrate relative to the substrate support pedestal 504. As such, the centering means insures the substrate is positioned at the desired location on the substrate support pedestal for processing and insures the substrate is in a position on the pedestal for pick up by the robot blade (not shown). The locating function permits full substrate deposition, i.e., deposition over the entire surface of a substrate. Preferably the alignment bumps are rounded at their apexes to avoid sharp corners which can cause particles to flake off into the processing environment.

[0036] In a typical processing environment, it is desirable to process a large number of wafers before having to replace or clean the deposition ring and the cover ring. Such a replacement becomes necessary when the build-up of deposition materials on the deposition ring begins to interfere with placement of the substrates on the pedestal, such that the substrates would begin to stick to the material deposited on the deposition ring.

[0037] FIGS. 6 and 7 depict an alternative embodiment of the invention that accommodates the repetitive deposition of relatively thick layers of material. This embodiment of the shield assembly 550 contains a deposition ring 522 having a channel or groove 520 proximate the periphery of its inside diameter. This groove permits additional build-up of deposited material relative to the planar configuration on the support along the edge of the substrate 14 without the material sticking to the substrate and without interfering the positioning and the orientation of the substrate on the pedestal 504. The centering means is located in the groove and thus comprises elongated centering pins 518. More specifically, four alignment pins 518-518 are positioned at 90 degree intervals in a rectangular array to effect the positioning function 360 degrees about the periphery of the substrate 14.

[0038] Useful materials for the components of the various shield assembly embodiments include stainless steel, aluminum, titanium, and copper. Stainless steel is a preferred material because it is relatively easy to clean. Aluminum or copper may be preferred when using deposition materials, such as tungsten, which do not adhere to stainless steel.

Claims

1. A substrate support apparatus comprising:

5 a pedestal (504) having a support surface for supporting a substrate (14) and having a flange (506) extending from the outer edge of the pedestal; and
 10 a deposition ring (508, 522) circumscribing said support surface for shielding said pedestal;

15 **characterised in that** the ring extends over and is removably supported on the pedestal flange and has a plurality of protrusions (512, 518) extending from a surface of said ring proximate to said support surface for centering a substrate upon the support surface as the substrate is placed upon the pedestal.

20 2. A substrate support apparatus as claimed in claim 1, **characterised in that** said deposition ring (508) is annular and has a rectangular cross-section.

25 3. A substrate support apparatus as claimed in claim 1, **characterised in that** said deposition ring (522) further comprises an annular groove (520).

30 4. A substrate support apparatus as claimed in claim 3, **characterised in that** said protrusions extend from a bottom surface of said groove (520).

35 5. A substrate support apparatus as claimed in claim 1, **characterised in that** a top surface of said deposition ring (522) is substantially coplanar with the support surface (502) of the pedestal (504).

40 6. A substrate support apparatus as claimed in claim 1, wherein the support surface (502) has a diameter that is substantially equivalent to a diameter of a substrate (14).

45 7. A substrate support apparatus as claimed in claim 1, **characterised in that** the support surface (502) has a diameter that is smaller than a diameter of a substrate (14).

50 8. A deposition chamber shield assembly for restricting the deposition of materials on internal chamber components during processing of a substrate in the deposition chamber, comprising:

55 a pedestal (504) having a support surface (502) for supporting a substrate (14) and having a flange (506) extending from the outer edge of the pedestal; and
 a shield member (10) extending circumferentially around the support surface of the substrate (14) to prevent deposition of the deposi-

tion chamber regions (516) shielded by said shield member during processing of the substrate in the deposition chamber;

characterised in that a deposition ring (508, 522) circumscribes the pedestal and is removably supported by said flange for shielding said pedestal; and

a cover ring (20) extends from the shield member over an outer edge of the deposition ring and terminates adjacent an edge of the substrate, said cover ring shielding an edge region of the deposition ring to prevent the passage of deposition materials past the edge of deposition ring.

9. A deposition chamber shield assembly as claimed in claim 8, **characterised in that** said deposition ring (508) is annular and has a rectangular cross-section.

10. A deposition chamber shield assembly as claimed in claim 8, **characterised in that** said deposition ring (508) further comprises centering means (512), located proximate to said support surface (502), for centering a substrate upon the support surface as the substrate is placed upon the pedestal.

11. A deposition chamber shield assembly as claimed in claim 10, **characterised in that** said centering means (512) comprises a plurality of protrusions extending from a surface of said deposition ring (508).

12. A deposition chamber shield assembly as claimed in claim 8, **characterised in that** said deposition ring (522) further comprises an annular groove (520).

13. A deposition chamber shield assembly as claimed in claim 12, **characterised in that** said deposition ring (522) further comprises centering means (518), located proximate to said support surface and within said annular groove, for centering a substrate upon the support surface as the substrate is placed upon the pedestal.

14. A deposition chamber shield assembly as claimed in claim 13, **characterised in that** said centering means comprises a plurality of elongate pins (518) extending from a bottom surface of said annular groove.

15. A deposition chamber shield assembly as claimed in claim 8, **characterised in that** a top surface of said deposition ring (522) is substantially coplanar with the support surface (502) of the pedestal (504).

5 16. A deposition chamber shield assembly as claimed in claim 8, **characterised in that** the support surface (502) has a diameter that is substantially equivalent to a diameter of the substrate (14).

10 17. A deposition chamber shield assembly as claimed in claim 8, **characterised in that** the support surface (502) has a diameter that is smaller than a diameter of a substrate (14).

15 18. A deposition chamber shield assembly for restricting the deposition of materials on internal chamber components during processing of a substrate in the deposition chamber, comprising:

a pedestal (504) having a support surface (502) for supporting a substrate (14) and having a flange (506) extending from the outer edge of the pedestal; and

a deposition ring (508) extending circumferentially around the substrate support surface and extending over the flange of the pedestal, such that the upper surfaces of the deposition ring and the substrate are coplanar, to prevent deposition on chamber regions (516) shielded by said deposition ring during processing of the substrate in the deposition chamber; and a cover ring (20) extending circumferentially around the deposition ring to prevent the passage of deposition materials past the pedestal, said cover ring having an inside diameter that is larger than the outside diameter of the substrate.

20 35 19. The deposition chamber shield assembly as claimed in claim 18, **characterised in that** said deposition ring circumscribes said support surface and is removably supported by said flange, said cover ring shielding an edge region of the deposition ring.

40 45 20. The deposition chamber shield assembly as claimed in claim 18, **characterised in that** the cover ring does not contact the substrate and does not overhang the substrate.

Patentansprüche

50 1. Substratträgervorrichtung

- mit einem Sockel (504), der eine Trägerfläche zum Abstützen eines Substrats (14) und einen Flansch (506) aufweist, der sich von dem Außenrand des Sockels aus erstreckt und
- mit einem Abscheidering (508, 522), der die Trägerfläche zur Abschirmung des Sockels umgibt,

dadurch gekennzeichnet, dass sich der Ring über den Sockelflansch erstreckt und entferbar an ihm gehalten ist sowie eine Vielzahl von Vorsprüngen (512, 518) aufweist, die sich von einer Fläche des Rings nahe an der Trägerfläche aus erstrecken, um das Substrat auf der Trägerfläche zu zentrieren, wenn das Substrat auf dem Sockel positioniert wird.

2. Substratträgervorrichtung nach Anspruch 1, dadurch gekennzeichnet, dass der Abscheidering (508) Kreisform und einen rechteckigen Querschnitt hat.

3. Substratträgervorrichtung nach Anspruch 1, dadurch gekennzeichnet, dass der Abscheidering (522) weiterhin eine Ringnut (520) aufweist.

4. Substratträgervorrichtung nach Anspruch 3, dadurch gekennzeichnet, dass sich die Vorsprünge von einer Bodenfläche der Nut (520) aus erstrecken.

5. Substratträgervorrichtung nach Anspruch 1, dadurch gekennzeichnet, dass eine obere Fläche des Abscheiderings (522) im Wesentlichen coplanar zur Trägerfläche (502) des Sockels (504) ist.

6. Substratträgervorrichtung nach Anspruch 1, bei welcher die Trägerfläche (502) einen Durchmesser hat, der im Wesentlichen zu einem Durchmesser eines Substrats (14) äquivalent ist.

7. Substratträgervorrichtung nach Anspruch 1, dadurch gekennzeichnet, dass die Trägerfläche (502) einen Durchmesser hat, der kleiner ist als ein Durchmesser eines Substrats (14).

8. Abscheidekammer-Abschirmanordnung zur Einschränkung der Abscheidung von Materialen auf inneren Kammerbauteilen während der Behandlung eines Substrats in der Abscheidkammer,

- mit einem Sockel (504), der eine Trägerfläche (502) zum Abstützen eines Substrats (14) und einen Flansch (506) hat, der sich von dem Außenrand des Sockels aus erstreckt, und
- mit einem Abschirmelement (10), das sich am Umfang um die Trägerfläche des Substrats (14) herum erstreckt, um eine Abscheidung auf den Abscheidkammerbereichen (516) zu unterbinden, die von dem Abschirmelement während der Behandlung des Substrats in der Abscheidkammer abgeschirmt sind,

dadurch gekennzeichnet,

- dass ein Abscheidering (508, 522) den Sockel umgibt und entferbar von dem Flansch zur Ab-

5 schirmung des Sockels getragen wird und

- dass sich ein Abdeckring (20) von dem Abschirmelement über einen Außenrand des Abscheiderings erstreckt und angrenzend an einen Rand des Substrats endet, wobei der Abdeckring einen Randbereich des Abscheiderings abschirmt, um das Vorbeigehen von Abscheidematerialien an dem Rand des Abscheiderings zu unterbinden.

10 9. Abscheidekammer-Abschirmanordnung nach Anspruch 8, dadurch gekennzeichnet, dass der Abscheidering (508) Kreisform und einen rechteckigen Querschnitt hat.

15 10. Abscheidekammer-Abschirmanordnung nach Anspruch 8, dadurch gekennzeichnet, dass der Abscheidering (508) weiterhin eine nahe an der Trägerfläche (502) angeordnete Zentriereinrichtung (512) zum Zentrieren eines Substrats auf der Trägerfläche aufweist, wenn das Substrat auf dem Sockel positioniert wird.

20 11. Abscheidekammer-Abschirmanordnung nach Anspruch 10, dadurch gekennzeichnet, dass die Zentriereinrichtung (512) eine Vielzahl von Vorsprüngen aufweist, die sich von einer Fläche des Abscheiderings (508) aus erstrecken.

25 12. Abscheidekammer-Abschirmanordnung nach Anspruch 8, dadurch gekennzeichnet, dass der Abscheidering (522) weiterhin eine Ringnut (520) aufweist.

30 13. Abscheidekammer-Abschirmanordnung nach Anspruch 12, dadurch gekennzeichnet, dass der Abscheidering (522) weiterhin eine in der Nähe der Trägerfläche und in der Ringnut angeordnete Zentriereinrichtung (518) zum Zentrieren eines Substrats auf der Trägerfläche aufweist, wenn das Substrat auf dem Sockel positioniert wird.

35 14. Abscheidekammer-Abschirmanordnung nach Anspruch 13, dadurch gekennzeichnet, dass die Zentriereinrichtung eine Vielzahl von langgestreckten Stiften (518) aufweist, die sich von einer Bodenfläche der Ringnut aus erstrecken.

40 15. Abscheidekammer-Abschirmanordnung nach Anspruch 8, dadurch gekennzeichnet, dass eine obere Fläche des Abscheiderings (522) im Wesentlichen coplanar zur Trägerfläche (502) des Sockels (504) ist.

45 55 16. Abscheidekammer-Abschirmanordnung nach Anspruch 8, dadurch gekennzeichnet, dass die Trägerfläche (502) einen Durchmesser hat, der im Wesentlichen zu einem Durchmesser des Substrats

(14) äquivalent ist.

17. Abscheidekammer-Abschirmanordnung nach Anspruch 8, dadurch gekennzeichnet, dass die Trägerfläche (502) einen Durchmesser hat, der kleiner ist als ein Durchmesser eines Substrats (14).

18. Abscheidekammer-Abschirmanordnung zum Einschränken der Abscheidung von Materialien auf inneren Kammerbauteilen während der Behandlung eines Substrats in der Abscheidekammer

- mit einem Sockel (504), der eine Trägerfläche (502) zum Abstützen eines Substrats (14) und einen Flansch (506) hat, der sich von dem Außenrand des Sockels aus erstreckt, und
- mit einem Abscheiderring (508), der sich am Umfang um die Substratträgerfläche herum und über den Flansch des Sockels hinaus erstreckt, so dass die oberen Flächen des Abscheiderrings und des Substratträgers coplanar sind, um ein Abscheiden auf Kammerbereiche (516) zu unterbinden, die durch den Abscheiderring während der Behandlung des Substrats in der Abscheidekammer abgeschirmt sind, und
- mit einem Abdeckring (20), der sich am Umfang um den Abscheiderring erstreckt, um den Vorbeigang von Abscheidematerial an dem Sockel zu unterbinden, wobei der Abdeckring einen Innendurchmesser hat, der größer ist als der Außen Durchmesser des Substrats.

19. Abscheidekammer-Abschirmanordnung nach Anspruch 18, dadurch gekennzeichnet, dass der Abscheiderring die Trägerfläche umgibt und entfernt von dem Flansch getragen wird, wobei der Abdeckring einen Randbereich des Abscheiderrings abschirmt.

20. Abscheidekammer-Abschirmanordnung nach Anspruch 18, dadurch gekennzeichnet, dass der Abdeckring das Substrat nicht berührt und nicht über dem Substrat hängt.

Revendications

1. Appareil de support de substrat comportant :

un socle (504) ayant une surface de support pour supporter un substrat (14) et ayant un rebord (506) s'étendant depuis le bord extérieur du socle ; et

un anneau (508, 522) de dépôt entourant ladite surface de support pour protéger ledit socle ;

caractérisé en ce que l'anneau s'étend au-dessus du rebord du socle par lequel il est supporté

de façon amovible et comporte plusieurs saillies (512, 518) s'étendant depuis une surface dudit anneau proche de ladite surface de support pour centrer un substrat sur la surface de support pendant que le substrat est mis en place sur le socle.

2. Appareil de support de substrat selon la revendication 1, caractérisé en ce que ledit anneau de dépôt (508) est annulaire et présente une section transversale rectangulaire.

3. Appareil de support de substrat selon la revendication 1, caractérisé en ce que ledit anneau de dépôt (522) présente en outre une gorge annulaire (520).

4. Appareil de support de substrat selon la revendication 3, caractérisé en ce que ladite saillie s'étend depuis une surface de fond de ladite gorge (520).

5. Appareil de support de substrat selon la revendication 1, caractérisé en ce qu'une surface supérieure dudit anneau de dépôt (522) est sensiblement coplanaire avec la surface de support (502) du socle (504).

6. Appareil de support de substrat selon la revendication 1, dans lequel la surface de support (502) a un diamètre qui est sensiblement équivalent à un diamètre d'un substrat (14).

7. Appareil de support de substrat selon la revendication 1, caractérisé en ce que la surface de support (502) a un diamètre qui est inférieur à un diamètre d'un substrat (14).

8. Ensemble à écran de protection pour chambre de dépôt destiné à limiter le dépôt de matière sur des constituants intérieurs de la chambre pendant le traitement d'un substrat dans la chambre de dépôt, comportant :

un socle (504) ayant une surface de support (502) destiné à supporter un substrat (14) et ayant un rebord (506) s'étendant depuis le bord extérieur du socle ; et

un élément à écran (10) s'étendant circonférentiellement autour de la surface de support du substrat (14) pour empêcher le dépôt sur les régions (516) de la chambre de dépôt protégées par ledit élément formant écran pendant un traitement du substrat dans la chambre de dépôt ;

caractérisé en ce qu'un anneau (508, 522) de dépôt entoure le socle et est supporté de façon amovible par ledit rebord pour protéger ledit socle ; et

un anneau (20) de recouvrement s'étend depuis l'élément formant écran au-dessus d'un bord extérieur de l'anneau de dépôt et se termine à proximité immédiate d'un bord du substrat, ledit anneau de recouvrement protégeant une région de bord de l'anneau de dépôt afin d'empêcher des matières de dépôt de passer au-delà du bord de l'anneau de dépôt.

9. Ensemble à écran de protection pour chambre de dépôt selon la revendication 8, caractérisé en ce que ledit anneau de dépôt (508) est annulaire et présente une section transversale rectangulaire. 10

10. Ensemble à écran de protection pour chambre de dépôt selon la revendication 8, caractérisé en ce que ledit anneau de dépôt (508) comporte en outre un moyen de centrage (512), placé à proximité de ladite surface de support (502), pour centrer un substrat sur la surface de support pendant que le substrat est mis en place sur le socle. 15

11. Ensemble à écran de protection pour chambre de dépôt selon la revendication 10, caractérisé en ce que ledit moyen de centrage (512) comporte plusieurs saillies s'étendant depuis une surface dudit anneau de dépôt (508). 20

12. Ensemble à écran de protection pour chambre de dépôt selon la revendication 8, caractérisé en ce que ledit anneau de dépôt (522) comporte en outre une gorge annulaire (520). 30

13. Ensemble à écran de protection pour chambre de dépôt selon la revendication 12, caractérisé en ce que ledit anneau de dépôt (522) comporte en outre un moyen de centrage (518), placé à proximité de ladite surface de support et à l'intérieur de ladite gorge annulaire, pour centrer un substrat sur la surface de support pendant que le substrat est mis en place sur le socle. 35

14. Ensemble à écran de protection pour chambre de dépôt selon la revendication 13, caractérisé en ce que ledit moyen de centrage comporte plusieurs ergots allongés (516) s'étendant depuis une surface du fond de ladite gorge annulaire. 45

15. Ensemble à écran de protection pour chambre de dépôt selon la revendication 8, caractérisé en ce qu'une surface supérieure dudit anneau de dépôt (522) est sensiblement coplanaire avec la surface de support (502) du socle (504). 50

16. Ensemble à écran de protection pour chambre de dépôt selon la revendication 8, caractérisé en ce que la surface de support (502) a un diamètre qui est sensiblement équivalent à un diamètre du sub- 55

trat (14).

17. Ensemble à écran de protection pour chambre de dépôt selon la revendication 8, caractérisé en ce que la surface de support (502) a un diamètre qui est inférieur à un diamètre d'un substrat (14).

18. Ensemble à écran de protection pour chambre de dépôt pour limiter le dépôt de matières sur des constituants intérieurs de la chambre pendant le traitement d'un substrat dans la chambre de dépôt, comportant :

un socle (504) ayant une surface de support (502) destiné à supporter un substrat (14) et ayant un rebord (506) s'étendant depuis le bord extérieur du socle ; et

un anneau de dépôt (508) s'étendant circonférentiellement autour de la surface de support du substrat et s'étendant au-dessus du rebord du substrat, de façon que les surfaces supérieures de l'anneau de dépôt et du support de substrat soient coplanaires, afin d'empêcher le dépôt sur des régions (516) de la chambre protégées par ledit anneau de dépôt pendant un traitement du substrat dans la chambre de dépôt ;

et un anneau de recouvrement (20) s'étendant circonférentiellement autour de l'anneau de dépôt pour empêcher le passage de matières de dépôt au-delà du socle, ledit anneau de recouvrement ayant un diamètre intérieur qui est plus grand que le diamètre extérieur du substrat.

19. Ensemble à écran de protection pour chambre de dépôt selon la revendication 18, caractérisé en ce que ledit anneau de dépôt entoure ladite surface de support et est supporté de façon amovible par ledit rebord, ledit anneau de recouvrement protégeant une région de bord de l'anneau de dépôt.

20. Ensemble à écran de protection pour chambre de dépôt selon la revendication 18, caractérisé en ce que l'anneau de recouvrement n'est pas en contact avec le substrat et ne s'étend pas au-dessus du substrat.

FIG. 1.

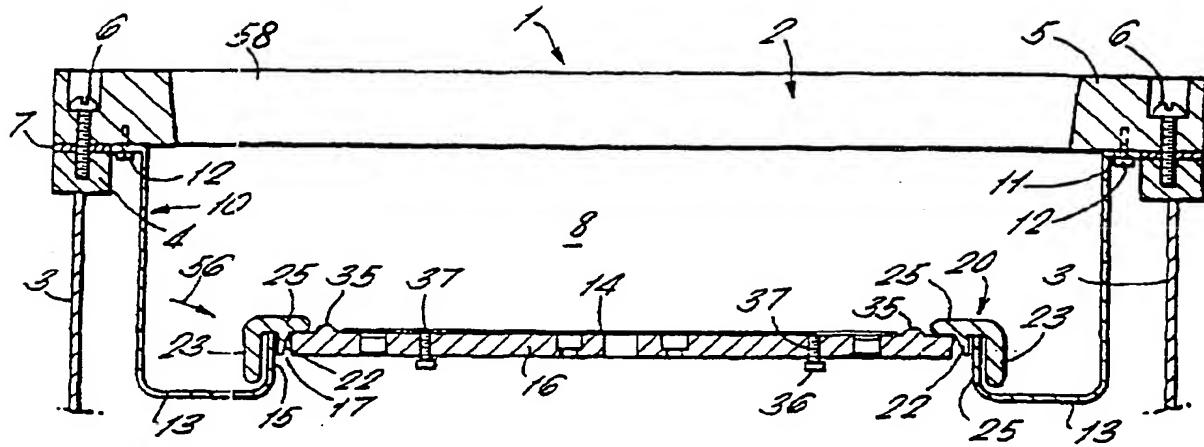


FIG. 2.

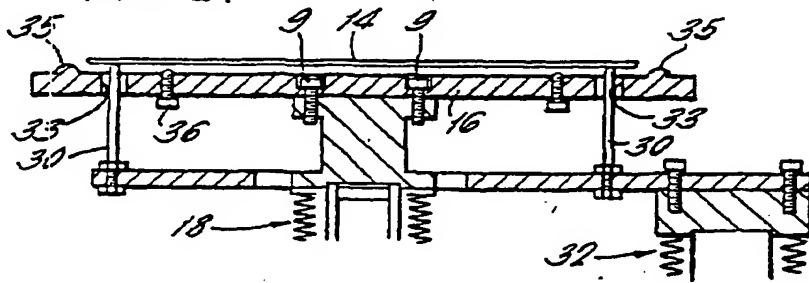


FIG. 3.

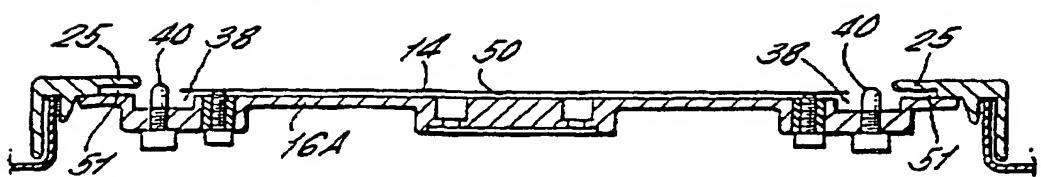


FIG. 4.

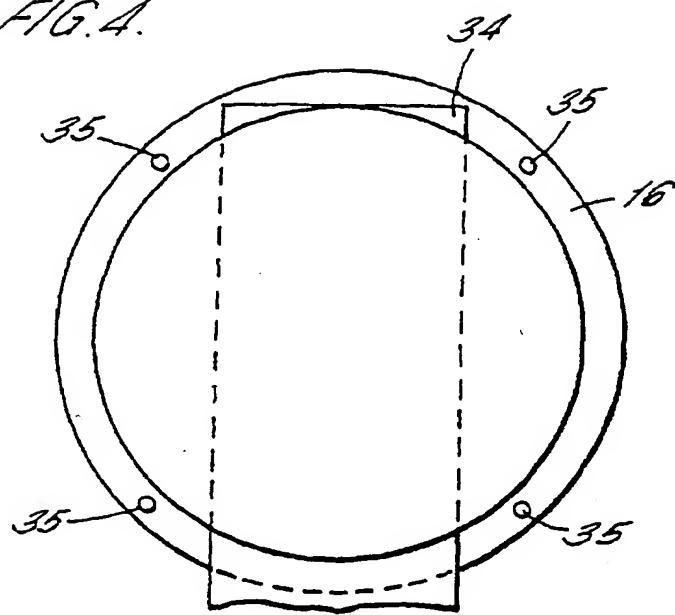


FIG. 5.

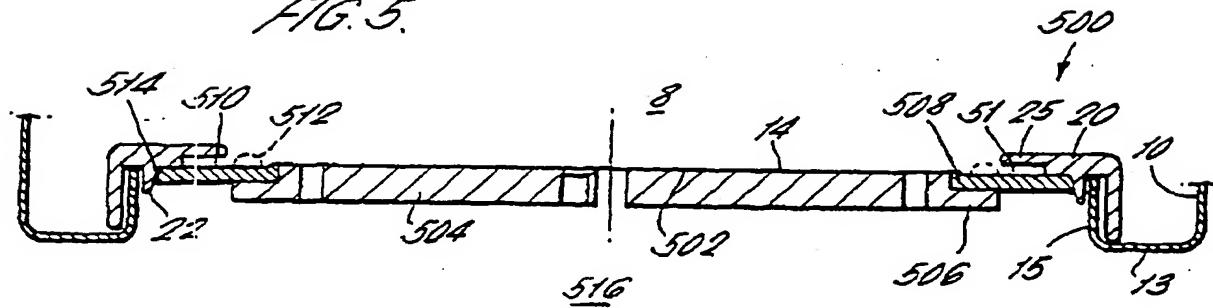


FIG. 6.

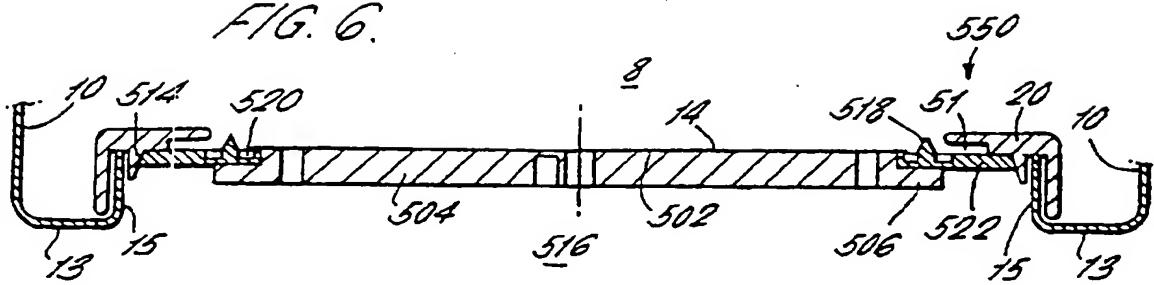


FIG. 7.

